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"HELIOS"

Direct Current Flaming Arc Lamps

For Constant Potential 110, 220 and 500 Volt Circuits

CARBON LIFE
24 HOURS
PER TRIM

THE MOST
EFFICIENT
ILLUMINATING
DEVICE ON
THE MARKET

FULLY
GUARANTEED

BRILLIANT
ILLUMINATION

RUGGED AND
SUBSTANTIAL
MECHANISM

SUITABLE
FOR INTERIOR
AND EXTERIOR
ILLUMINATION

THE GREAT
FACTORY LIGHT

MINIMUM
MAINTENANCE

INTRODUCTION

WHILE the history of luminous or flaming arc lamps dates back to the earliest period of electric lighting, such lamps were not regarded as commercially satisfactory until about six years ago, and it is only within the past two or three years that an extended market has been found for their sale in the United States.

The improvement in the electrodes as well as in the mechanism has resulted in lamps of this type coming into general use for all purposes of illumination, and as the efficiency is greater than that of any other known form of producing light, the use will increase, in fact, many engineers predict that all other forms of devices for producing light must either be greatly increased in efficiency or be entirely superseded.

Source of Efficiency

¶ By adding to a hollow carbon certain salts which are volatilized at a relatively low temperature, the character of the arc from the carbon or electrode is greatly changed, a flaming arc being produced, which yields great illumination from the flame as well as yielding equally as much from the crater as an ordinary carbon would do.

It has been found impracticable to operate electrodes containing salts one above the other, hence, the established practice is to have both electrodes down pointing and so arranged that they converge to a point where the arc is struck. As no obstructions are below the arc this further increases the efficiency, does away with all shadows, and gives a most excellent distribution of the light.

Color of Light

¶ The color of the light depends on the kinds of salts which are used in the core of the electrode.

We have adopted a mixture which gives light as near that of daylight as possible, and as this mixture does not give off objectionable fumes the lamps can be used for interior lighting as well as for exterior illumination.

Comparative Efficiencies

¶ The table below shows the watts per candle power of the prominent electric illuminating devices, based on units which are considered standard:

Carbon filiment incandescent lamps.....3.1 to 4.0 watts per C. P.
Tungsten filiment incandescent lamps.....1.2 to 1.5 watts per C. P.
Enclosed arc lamps.....1.0 to 2.1 watts per C. P
Flame arc lamps (Helios)..... .25 watts per C. P.

¶ While the flame lamp is of vastly greater efficiency than the other types mentioned, and is also much more efficient than lamps of the glower or mercury vapor type, it should not be assumed that flame lamps may be indiscriminately installed and always give more economical results. Each case must be worked out on its own merits and, in general, flame lamps will be found more economical in ultimate cost where large areas are to be lighted or where smoke, dust or vapor is present, and particularly so where walls are dark, but may not prove economical for very small installations. In the latter case, however, the tremendous gain in volume of light may be of sufficient value to make larger maintenance expense tolerable.

¶ Extreme conditions illustrating the point would be the case of a small retail store using two enclosed lamps over the pavement, compared to a large steel mill using 200 enclosed lamps. If two flame lamps replace the enclosed lamps, the current would be equal, the carbon bill would be 24 times greater, the labor for trimming would be 6 times greater, the first cost 2½ times greater.

¶ The volume of light would be 6 times greater, and from an advertising point of view might be advantageous, in fact, thousands of flame lamps have been installed under these conditions, and, as they remain in use, it is reasonable to suppose that the results are favorable.

¶ If the 200 enclosed lamps were replaced by sufficient flame lamps to give equal illumination, no more than 40 would be required, and a great saving can be shown in total expense, but would largely depend on the total burning hours per annum, though the cost of producing current and other conditions must also be carefully considered.

¶ Assuming cost of current is 2 cents per K. W. hour, and that lamps average 4 hours per day, 300 days per annum, the enclosed lamps would consume, say, 1000 amperes, 110 volts, or 132,000 K. W. hours per annum; flame lamps, 200 amperes, or 26,400 K. W. hours, a saving at 2 cents per K. W. hour of $2112.00. The labor of trimming would be equal, as the flame lamps require trimming 5 times as often, but only one-fifth as many are used. The carbon

expense would be increased $1540.00, the repairs would be one-fifth as great, the expense for glass one-fifth, and the risk of mechanical damage 1 to 5, the fewer the targets the less the chance of hitting one. A clear saving is thus shown, even at the very low assumed cost of current, and which would be greater where current costs more, and still greater where the burning hours per annum are longer. Further, the saving on the power plant of 800 amperes, 110 volts, allowing nothing for line loss, would be in many cases a feature of predominating importance, as that amount of power could be utilized for other purposes.

New Installations

¶ Here an even greater saving can be shown, as the portion of the power plant devoted to illumination need only be one-fifth as great in capacity, saving thousands of dollars, requiring one-fifth the copper, also saving over 50 per cent. on the first cost of the lamps, and of course reducing the depreciation charges to an enormous extent. This saving would apply not only to a comparison between enclosed and flame arc lamps, but also to carbon or tungsten filiment incandescent lamps, which would respectively consume 1200 and 435 amperes, would greatly increase the cost of wiring and power plant, and costing respectively $960.00 and $2400.00 per annum for renewal of bulbs only. One flame lamp will furnish illumination equal to five enclosed lamps, or sixty 16 C. P. incandescent lamps.

The flame lamp, having the decided advantage, must necessarily be considered as here to stay, not coming, but here permanently.

General Type

¶ The Helios flame lamp is arranged to use down pointing electrodes, the mechanism is of the differential type, is extremely rugged, and while so radically different from all other makes of flame lamps that comparative descriptions of its parts are impossible, the general features may be represented by cuts, and some features of importance not possessed by other lamps may be mentioned to advantage.

General Appearance

¶ The cut on front cover shows the complete lamp, and as may be noted, the design is pleasing. The cases are made from heavy sheet metal, and may be finished with any one of many standard finishes as per list, page 7.

Blow System

¶ Is one of the most important features. That used by us is the result of several years' experience, and is extremely effective, while adding nothing which will cause trouble. The blow magnet is wound with bare copper wire, hence there is nothing to burn out. (Patent applied for.)

Operating Mechanism

¶ Is very simple, but a radical departure from existing methods. The reliability and ruggedness of same, and the steadiness in burning is sufficient proof of its merits. Standard round carbons are used, and there are no obstructions below the arc whatever, such as rests or stops.

Finish of Mechanism

¶ All parts are plated and lacquered to prevent corrosion, so that in case repairs are necessary, the parts may be easily separated. Parts which are not so treated become so badly corroded that even screws cannot be removed.

Carbon Holders

¶ Are a recent production designed to overcome the troubles with existing types. They grip the carbons securely, and yet are so arranged that it is practically impossible to crush the electrodes. This is of great importance, as the electrodes are comparatively expensive, and any device which will tend to keep down maintenance costs must of necessity appeal to the user. (Cut page 6.)

Increase of Carbon Life

¶ Practically all existing makes of flame lamps strike the arc by moving one electrode sideways away from the stationary electrode. This makes it necessary to provide a slot in the heat resisting plate which is usually provided, and which is located just above the arc. The effect of the slot is to induce air currents, which in turn aid the rapid combustion of the electrodes. The Helios mechanism avoids the necessity for the slot, and therefore, the life of the electrodes is greatly prolonged.

¶ We guarantee 24 hours' life per trim, there's the evidence of the truth of the claim, and the electrodes are only 400 millimeters long, the length that in other lamps gives only 10 hours' life.

Results of Experience

¶ Our long experience with lamps of all types has enabled us to avoid many weaknesses and to add operating characteristics of value. For instance, the lamps can be readily trimmed, and all parts are accessible. (Cut 1, page 6.)

¶ The case is rigidly held in position by an eccentric clamp which, although reliable, is unlatched by simply pulling the handle provided for the purpose.

¶ The globe is securely held by a locking clamp of recent design, which enables the trimmer to clean the globe without loss of time. The globe hangs by a single chain while being cleaned. (Cut 2, page 6.)

¶ The pan in bottom of globe receives the slag which drips from the electrodes. It is held in place by a coiled spring which fits into a groove, and can

be removed by disengaging spring from groove. The spring is attached to the grooved collar, hence cannot be lost, nor can pan be lost, unless it is taken out of globe through the top.

Automatic Cut-out

¶ As flame lamps are generally burned either 2 in series on 110 volts, or 4 in series on 220 volts, some device should be added to each lamp so that a defect in one lamp will not open the circuit and thereby interrupt the other lamps in same series. While other makes of flame lamps are not so equipped, the Helios lamp is, extra resistance being supplied which is equal to the normal voltage drop at the arc, and if arc fails the automatic cut-out inserts the resistance and thus keeps the circuit closed.

¶ Both the ballasting resistance and the auxiliary resistance are self-contained. There are no external parts whatever.

Maintenance Costs

¶ We have designed this lamp especially for the use of large industrial institutions, and as maintenance costs are closely scanned by such concerns, we have had continually in mind the necessity for making such cost the lowest possible. To follow out this policy we have made a price on the lamps which is reasonable, although this lamp costs more to manufacture than any other on the market, and we propose to supply parts, glassware and electrodes at low cost. For example, the carbons cost not exceeding $10.00 per hundred pairs, as compared with prices of $13.00 to $16.50 for other makes.

¶ This policy we propose to continue and at any time we find it possible to reduce the cost of lamps or electrodes we will notify users and give them the benefit of any reductions.

Current Consumption

¶ The maximum voltage required at the arc is 45, and as only a small amount of ballasting resistance is necessary, it is evident that two such lamps can be satisfactorily operated in series on 110-volt circuit. The lamps have been designed to operate at 9¾ amperes, hence a pair will consume 1073 watts, or 536 watts each, operating 2 on 110 or 4 on 220 volts. Where it is desired to operate a single lamp on 110 volts or only 2 on 220 volts, additional resistance must be provided to reduce the line voltage, and, while we separately list such lamps, there is no difference, except in the amount of the resistance, and in either case the resistance is self-contained.

¶ When operated in this manner, the efficiency of each lamp is only one-half as great; in other words, one lamp will consume 1073 watts and give no more light than if another was burning along with it. The lamps should therefore be operated 2 on 110 or 4 on 220 volts, in order to secure maximum efficiency.

FIGURE 1

INDESTRUCTIBLE RESISTANCE

FIGURE 2

CARBON HOLDER

Can be hung above cranes, and, owing to intensity and color of light, most satisfactory results are obtained.

CATALOGUE NUMBERS AND LIST PRICES

For Two in Series on 100-130 Volts, or Four in Series on 200-250 Volts, or 10 on 550 Volts

Direct Current Only

Number	Finish	Material of Case	List Price
4731	Black Japan	Bronze	$43.00
4726	Polished Brass	Brass	45.50
4727	Scoured Brass	Brass	45.50
4736	Oxidized Copper, Spotted	Bronze	43.00
4737	Oxidized Copper, Striped	Bronze	43.00
4701	Oxidized Copper, Black	Bronze	43.00
4702	Natural Bronze or Copper	Bronze	43.00
4703	Nickel	Bronze	48.00

For Single Burning on 100 to 122 Volts, or Two in Series on 200 to 244 Volts

As previously explained we do not recommend lamps to be operated in this manner.

Number	Finish	Material of Case	Price
4831	Black Japan	Bronze	$45.00
4826	Polished Brass	Brass	47.50
4827	Scoured Brass	Brass	47.50
4836	Oxidized Copper, Spotted	Bronze	45.00
4837	Oxidized Copper, Striped	Bronze	45.00
4801	Oxidized Copper, Black	Bronze	45.00
4802	Natural Bronze or Copper	Bronze	45.00
4803	Nickel	Bronze	50.00

While bronze and copper are similar in appearance, we use bronze for case material, it being more durable and much harder.

We recommend spotted, oxidized copper finish as being the most durable and also makes best appearance.

Globe type "M" opal or alabaster, list $1.35 each; boxing extra.

DIRECT CURRENT CARBONS, TYPE "MC"

Positive carbon, 10 x 400 MM., cored
Negative carbon, 9 x 400 MM., cored
} Prices on application.

Weight complete, 35 pounds. Length over all, 36 inches.

With each lamp is supplied sufficient carbons for two complete trims, also an extra heat-resisting plate, and with each shipment a suitable brush for cleaning mechanism and globe. The globe is also included in price of lamp.

INSTRUCTIONS

These lamps are for *direct current* only.

Positive carbons must be 10 millimeters by 400 millimeters.

Negative carbons must be 9 millimeters by 400 millimeters.

Globes are known as type M, alabaster or opal.

When shipped these lamps are adjusted to operate under one of the following conditions, depending on customers' specifications, a marked copy of these instructions accompanying each shipment.

_____ Single burning on 110 volts.
_____ 2 in series on 110 volts.
_____ 2 in series on 220 volts.
_____ 4 in series on 220 volts.

Indicate which by an (X) opposite proper designation.

(1) The lamps for any of the above circuits are exactly alike, the only difference being in the amount of the resistance, and if it is desired to change from one condition to another, it can be done by adding or cutting out resistance. There are three resistance spools near the top of the lamp arranged for 2 on 110 volts (type 4700), two of which are provided with bands, which can be moved to cut out or insert resistance, the third is only in circuit when the automatic cut-out operates, and requires no adjustment. If the lamps are wanted to operate 2 in series on 110 volts, or 4 in series on 220 volts, the cable near the top of the lamp (tagged A) should be attached to band stamped "B," and band "B" can be moved to proper point, as explained later. If the voltage is, say, 120 or 240, the cable "A" should be transferred to band "C," thus inserting more resistance, and this band can be moved to proper point. When cable is attached to band "C" and band moved to the left end of spool, the lamps will operate up to maximum voltage as per list page 7. Moving any band to which the cable may be attached towards the left cuts in resistance and will reduce the arc voltage correspondingly. The type 4800 lamp has four spools, the fourth being put in circuit by placing cable on band "D." When cable is on "D," and this band moved to extreme left, the amount of resistance is sufficient to care for about 122 volts per lamp, so that two lamps can be operated in series on 244 volts.

When installed, be sure that binding post marked "P" *on each lamp* is towards the positive main, and that the switch is thrown to position "ON." Lower the case and allow same to be suspended by chains provided for that purpose. Remove any dirt which may have entered the lamp during transportation; cut the string which secures the carbon holders, push these carbon holders and their connecting bridge to top of lamp, insert one of the larger

sized carbons (10 mm. in diam.) in one of the positive holders, then one of the smaller sized carbons (9 mm. in diam.) in the opposite negative holder, then another large carbon in the remaining positive holder, and finally the remaining negative carbon in the proper holder. The polarity of the holders can be ascertained by the marking on top of the brass casting at bottom of lamp. Follow this sequence in trimming, as time will be saved by so doing. When inserting the carbons, pass the upper end of the carbon into the space between the holder and the central tube of the lamp, then pass the lower end into the proper lava bushing in the lower casting until the carbon can enter the holder. Be sure that the carbons are all pushed into their holders as far as possible, and securely clamped; also that the conducting wire in the carbon is turned away from the arc, as the current naturally follows this wire, which if turned in will cause a short arc. After carbons are all in place, see that they are not wedged at their points by depressing the plunger of the series magnets, thus raising the carbons. Then let the carbons return by their own action and lamp is ready to be operated.

The carbons are especially designed for the lamps, but care should be taken to note whether, after trimming, the burning ends are even, if not, break off a small piece from the longer ones. The ends of the carbons need not be tapered, but can and should be blunt. If they have a long taper, they may wedge and prevent the mechanism from operating promptly when current is thrown on.

We will not be responsible for results unless proper carbons are used, which we can supply, or on application we will advise the names of makers who can supply proper carbons.

ADJUSTING

After approximately adjusting the resistance as above it is safe to throw the current on. It is better to start with too much resistance than too little. After lamps have been burning *at least 20 minutes*, having first placed an ammeter in series with the lamps, observe whether the current is 9¼ amperes. If too high, insert more resistance in *each lamp* by moving the adjusting band of each lamp towards the left; if too low cut out resistance. The resistance in each lamp should be as nearly equal as possible and can be ascertained closely enough by simple inspection. It is possible to adjust the current to the correct volume and yet have too much resistance in series, resulting in the arc voltage being too low, and in such cases cutting out some of the resistance will not increase the current, as the arc voltage would increase corresponding to the amount of resistance cut out. It follows therefore *that all the resistance possible should be cut out without the current exceeding* 9¼ *amperes*, and then the mechanism will automatically take care of the arc voltage.

A voltmeter should be connected to the posts from which the carbon holder cables swing and the resistance adjusted so that the arc shows about 36 volts just after feeding has occurred and that feeding again occurs at about 42 volts.

The adjustment must be made in accordance with these instructions; otherwise unsatisfactory results are sure to follow.

If the voltage of the circuit varies, the current in lamps will vary; therefore the current should be adjusted to *an average* of 9¾ amperes.

If, after being adjusted, it is found that one carbon burns faster than its mate, it is evidence that the adjustment has not been properly made. If positive carbon burns continuously faster than the negative, the lamp is either not getting enough current, or too much resistance is in series and the arc voltage too low. The remedy is to cut out resistance. In such cases, each lamp in the same series should show the same trouble, and some resistance should be cut out of each lamp. If each lamp did not show the same trouble, it would indicate that the arc of the one lamp was not normal, due to some undue friction that prevented the electrodes from feeding promptly.

CLEANING

The globe can be lowered and allowed to hang by its chains while being cleaned out. The pan in bottom of globe can be removed by pulling off the spiral band, any dirt inside the globe being then readily brushed through the hole.

A brush accompanies each shipment, which can be used to clean both the mechanism and globe, a thorough cleaning being very desirable each time the lamp is trimmed. The central tube and the two side rods should be wiped smooth with a dry cloth each time the lamp is trimmed, also noting that the central cross-bar moves freely up and down, also clean the contact points of the automatic cut-out, which is located just above the shunt magnets.

CAUTION

Keep mechanism and globe clean.

Use only type MC, 10 and 9 x 400 mm. carbons of approved make.

Do not disturb the adjustment of the blow magnet, as it has been carefully adjusted prior to shipment.

Do not use the double contact switch at top of lamp except when you want to trim or examine one lamp without interrupting other lamps in same series. This is the only function of the switch, and a suitable switch should be provided in a handy location for throwing the current on and off of each series of lamps. Be sure the switch is thrown completely over one way or the other, and not straddling the two contacts or only partially in contact with either.

Do not use any grease or other lubricants on any part of the lamps.

NOTE

Each lamp has an automatic cut-out and auxiliary resistance, self-contained, so that if, for any reason, the arc voltage exceeds normal, the cut-out will operate and throw the current through the resistance, this being sufficient to replace the arc voltage; therefore the other lamps in same series will not be interrupted. This also protects the shunt magnets, hence the contact points should be kept clean.

SCHEDULE OF PARTS

For Convenience in Ordering when Required

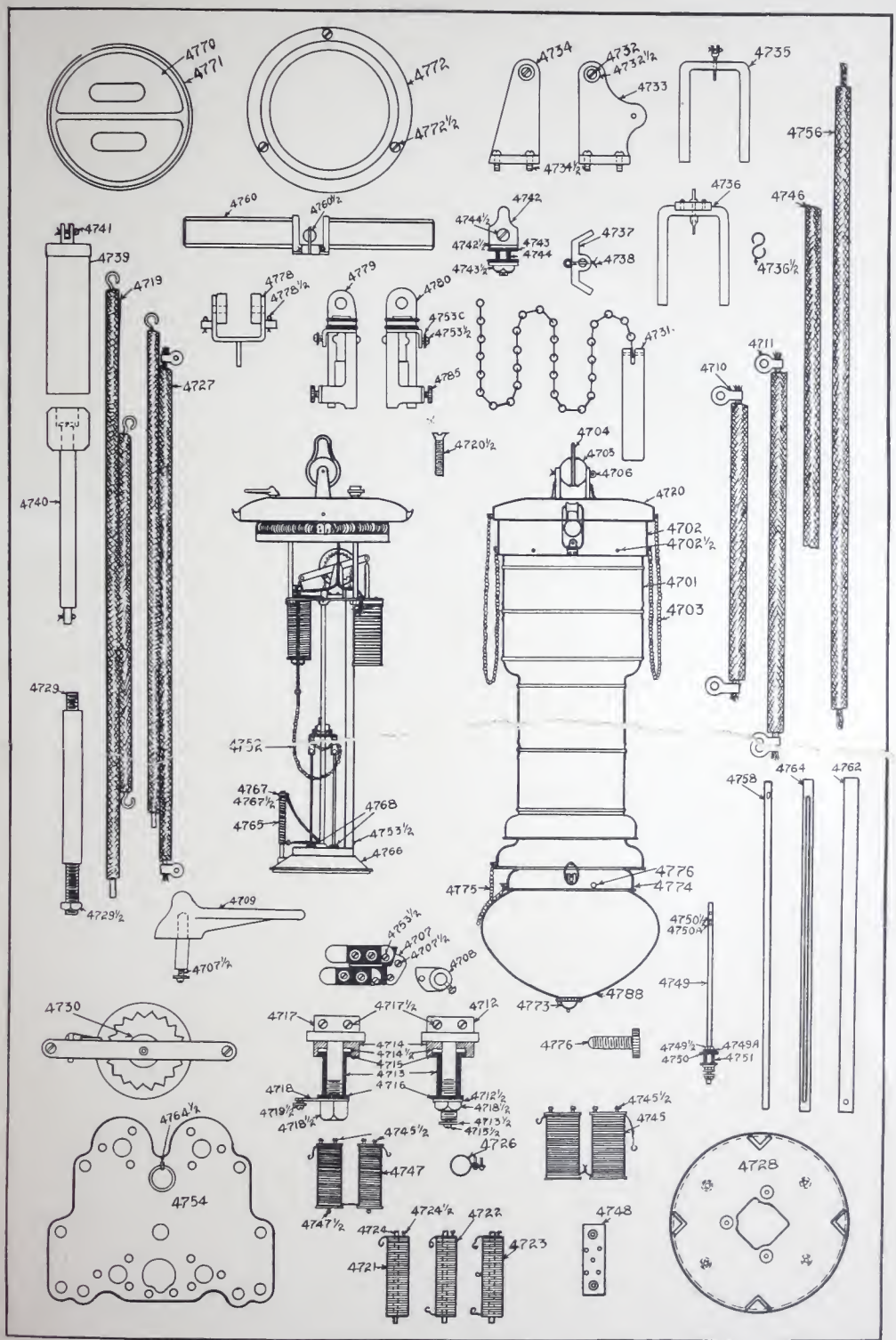
No.	Description of Parts	Price
4701	Case (state finish) made of bronze	$6 40
4701	Case (state finish) made of brass	6 40
4702	Upper case with handle (state finish) bronze	2 80
4702 ½	Screw to secure 4701 to 4702 (6)	02
4703	Chain to support case (2)	30
4704	Ring for support of lamp	15
4705	Porcelain insulator for 4704	04
4706	Cotter pin for 4705	02
4707	Switch blades complete	50
4707 ½	Screw to secure 4707 to 4708 and 4709 (2)	02
4708	Switch blade casting with set screw	15
4709	Switch arm casting	40
4710	Cables with terminals to connect 4707 to 4723	15
4711	Cable with terminals to connect 4712 to 4726	20
4712	Negative binding post	45
4713	Mica bushing for 4712 or 4717 (2)	10
4713 ½	Screw to secure cable to 4712	02
4714	Porcelain insulator (2)	06
4714 ½	Metal washers for 4712 or 4717 (2)	02
4715	Small mica washers for 4712 or 4717 (2)	02
4715 ½	Metal washer for 4713 ½	02
4716	Large mica washers for 4712 on 4717 (2)	08
4716 ½	Negative binding post nut	10
4717	Positive binding post	45
4717 ½	Binding post screws (4)	02
4718	Connection washer for 4717 and 4719	05
4718 ½	Positive binding post nut	10
4719	Twin cable connecting 4707 and 4717 to 4745 and 4742	30
4720	Top casting	1 15
4720 ½	Screw for 4720 (3)	05
4721	Resistance spool (wound) with one loop	50
4722	Resistance spool (wound) with two loops	50
4723	Resistance spool (wound) with three loops	50
4724	Rod for resistance spools (3)	10
4724 ½	Screw to anchor resistance spools (3)	02
4725	Screw, nut and washers for connection (8)	06
4726	Resistance band complete (2)	30
4727	Twin cable from cut-out resistance to 4755 and 4742	15
4728	Upper plate casting	1 00
4729	Rod for supporting 4728 (4)	20
4729 ½	Nut for 4729 (4)	03
4730	Walking beam complete	6 30
4731	Feed chain with weight	90
4732	Pivot screw for 4730 (2)	05
4732 ½	Washer for 4732	02
4733	Walking beam support with tripping pin	30
4734	Walking beam support without tripping pin	25
4734 ½	Screw to secure 4733 and 4734 to 4754 (4)	02
4735	Series plunger with adjustable eye	40
4736	Shunt plunger with cut-out bridge support	60
4736 ½	Adjusting link for plungers	03
4737	Cut-out bridge	15
4738	Cotter pin for securing 4737	02
4739	Dash-pot cylinder (complete)	60
4740	Dash-pot piston (complete)	65
4741	Cotter pin for 4739	02
4742	Cut-out contact (2)	20
4742 ½	Metal washer for 4742 (4)	02
4743	Mica washer for 4742 (4)	02
4743 ½	Nut for 4742 (2)	02
4744	Lava bushing for 4742 (2)	$ 05
4744 ½	Screw to secure 4742 to wire (2)	02
4745	Series magnets (per pair)	4 40
4745 ½	Screw to secure 4745 to 4754 (12)	02
4746	Asbestos covering for wires (1 foot)	05
4747	Shunt magnets (per pair)	4 75
4747 ½	Screw to secure 4747 to 4748 (4)	02
4748	Dash-pot support	30
4749	Connection rod (2)	20
4749 ½	Nut for 4749 (6)	02
4749-A	Metal washer for 4749 (10)	02
4750	Mica washer for 4749 (4)	03
4750 ½	Screw to secure 4752 to 4749 (4)	02
4750-A	Metal washer for 4750 ½ (2)	02
4751	Lava bushing for 4749 (2)	10
4752	Beaded connection cable (2)	35
4753	Beads (100)	09
4753 ½	Screw to secure cable to carbon holder (4)	02
4753-C	Metal washer for 4753 ½ (4)	02
4754	Upper frame casting	1 85
4755	Asbestos covered wire to 4727	15
4756	Asbestos covered cable to 4749	30
4756 ½	Screw for connecting 4756 to 4767	02
4756-A	Metal washer for 4756 ½ (2)	02
4758	Side rods (2)	35
4760	Sliding cross tree	60
4760 ½	Ball for 4760 (2)	10
4762	Centre tube	65
4764	Counter weight tube for chain	60
4764 ½	Headless screw to secure 4762 to 4766 (6)	02
4765	Blow magnet (wound)	40
4766	Lower casting	2 10
4767	Adjusting band for 4765	25
4767 ½	Screw to secure 4767	02
4768	Lava guide bushing for negative side (2)	10
4769	Lava guide bushing for positive side (2)	10
4770	Economizer	15
4771	Magnetic shield	10
4772	Economizer support	15
4772 ½	Screw to secure 4772 (3)	02
4773	Ash pan for globe	45
4774	Globe collar (state finish)	1 90
4775	Chain for lowering globe	15
4776	Knurled-head screw to secure globe (3)	08
4778	Guide for carbon holder (2)	35
4778 ½	Cotter pin for 4778 (2)	02
4779	Positive carbon holder (2)	50
4780	Negative carbon holder (2)	50
4785	Screw to secure carbons (4)	05
4786	Cement for attaching 4768 or 4769	15
4787	Brush for cleaning lamp	30
4788	Globe	1 35
4789	Globe net	35

In addition to above parts, following are required for Type 4800.

4821-H	Resistance Spool (wound with one connection loop) (1)	1 15
4822-H	Resistance Spool (wound with connection loop at each end) (1)	1 15
4824	Rod for supporting resistance spool (1)	10
4824-A	Screw to anchor resistance spool (1)	02
4825	Screw, nut and two washers for connection purposes (1)	02
4926	Resistance band, complete with screws, washers and long nuts (1)	15

Positive carbons, 10 x 400 mm., cored
Negative carbons, 9 x 400 mm., cored
} Prices on application.

Note: The number in brackets indicates quantity used per lamp.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4764½
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4728

We solicit your inquiries, not only for flame arc lamps, but also for any type of enclosed arc lamps, direct current watt-meters, constant current regulators for series A. C. arc lighting systems, and other highly specialized devices.

Constant Current Regulators for Series Tungsten Systems Operating Direct from A. C. Mains

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ENCLOSED ARC LAMPS

For 100–125 volt D. C. circuits, usual type.

For 100–125 volt D. C. circuits, high efficiency, 97 volts at arc.

For 200–250 volt D. C. circuits, single carbon, multiple burning.

For 200–250 volt D. C. circuits, twin carbon, multiple burning.

For 200–250 volt D. C. circuits, single carbon, multiple-series burning, both with and without automatic cut-out and auxiliary resistances.

For 500–600 volt D. C. circuits, multiple-series burning, both with and without automatic cut-out and auxiliary resistance.

For constant current D. C. circuit, any amperage.

For 100–125 volt A. C. circuits, usual type.

For 200–250 volt A. C. circuits, single carbon, multiple burning.

For 200–250 volt A. C. circuits, single carbon, multiple series burning.

For 440–450 volt A. C. circuits, single carbon, multiple-series burning.

For constant current A. C. circuit, any amperage.

All A. C. types for any frequency, 25 to 140 cycles.

CONSTANT CURRENT REGULATORS FOR ARC LIGHTING

For any primary voltage, all frequencies and amperages.

WATT-METERS

The Bastian, for all D. C. voltages, 10 and 20 amperes.

STORAGE BATTERIES

Interesting bulletins describing will be gladly forwarded on request.

GUARANTEE

EVERY device of any description manufactured or sold by us, is guaranteed as to correctness of design, perfection of material and high grade workmanship, and we will repair or replace any device which proves defective, provided said device has been used under normal and proper conditions.

We will not be responsible for cost of any repairs made outside our factory, nor for any inconvenience or loss which may be suffered by reason of defects.

Every device is carefully tested before shipment, and failures are practically unknown.

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